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# **Problem-Based Learning and Clinical Reasoning: An Action Research Study with Occupational Therapy Students**

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**Abstract:** Framed from a social constructivist perspective this action research study explored a problem-based learning approach and its relationship to occupational therapy students' clinical reasoning skills. Rich text provide support for the key qualitative findings. An independent t-test performed on the pre-post test yielded statistically significant improvement at the  $p < .018$ .

## **Introduction**

Over the past several years, formal settings of higher education (colleges/universities) have seen a greater number of adult students enrolling in their undergraduate classes. Recent statistics from the *U.S. Department of Education* show that adult students are the fastest growing educational demographic, and these numbers are steadily increasing. Institutions of higher education have an obligation to provide sufficient preparation to their students so they can perform the role for which they are being educated. It has been documented, however, that students' reasoning skills are less than adequate. According to the 1998 report from the Boyer Commission on Educating Undergraduates in the Research Universities, students graduating from these institutions are often unable to think logically, learn independently or solve problems by integrating and applying learned information. The Commission's report is disappointing, and is even more disturbing in light of the fact that many of these students, and especially adult learners, are preparing for critical careers in the human health care professions.

While logical thinking, independent learning and problem solving initiative are critical to numerous professions, these traits are especially necessary in healthcare fields. Logical reasoning and problem solving are vital components of the clinical reasoning process that healthcare professionals at all levels use on a day to day basis. Clinical reasoning in occupational therapy practice refers to the thinking, decision-making and 'know-how' that therapist use in the process of collecting client data. It is the process of planning, directing, critically thinking, performing and reflecting on client care (Mattingly & Fleming, 1994)

The extent to which a therapist is able to use clinical reasoning skills effectively determines the quality of care given to a client. It is therefore essential that the professional preparation of occupational therapy students include pedagogies that encourage the development of clinical reasoning skills. One extremely promising pedagogy mentioned by both the World Federation of Occupational Therapy and The Boyer Report, is problem-based learning (PBL). According to Barrows (1986) PBL is simply learning that results from the process of working towards the resolution of a problem. Limited evidence exists in the occupational therapy literature on the effectiveness of PBL and clinical reasoning. It is critical that further research be undertaken to glean greater insight into the relationship between PBL and clinical reasoning skills. Therefore the purpose of this classroom action research study was to explore the practice of problem based learning with occupational therapy students and the relationship of PBL to the students' clinical reasoning skills.

## Methodology

The methodological design of this study involved an action research study. Action research inquiry includes learning about the practice from those involved in it, planning for changes in the practice, implementing those changes, and evaluating the success of the changes. The direct result of action research is the generation of practical knowledge that has the potential of improving a particular system (Carr & Kemmis, 1986; Denzin & Lincoln, 2000). Because this study sought to explore the relationship of PBL on occupational therapy student's clinical reasoning skills, the course I chose, Activity Analysis II was directly related to the practice of occupational therapy. A convenience sample (consisting of 36 occupational therapy students enrolled in the course) was used. The eight week PBL assignment engaged students in a complex case study with an actual client. The methods of data collection included a pre-post test, participant observation, three informal focus groups, document analysis (field notes, student blackboard postings, student reflection papers and projects), and post semi-structured interviews. The qualitative data was analyzed using a constant comparative method (Denzin & Lincoln, 2000). Furthermore, to enhance the trustworthiness of the findings member checks and peer reviews were conducted.

## Findings

The key qualitative findings from this study are presented in four distinct phases: Orientation to PBL; Case Study Introduction; Meeting the Client; and Final Reflections. Phase one and two presented findings that focused primarily on how the students initially experienced and adjusted to the implementation of PBL pedagogy. The third phase presented key findings on the nature of clinical reasoning used by the occupational therapy students as they met and collaborated with the client on treatment interventions to address presenting problems. The findings from the fourth phase provided insight to the students' feelings and reactions following the completion of the PBL experience, as well as their perception of the relationship between PBL and clinical reasoning. An independent t-test performed on the pre-post test yielded statistically significant differences. The following section offers a brief overview of the four phases and their key findings.

### *Phase One: Orientation to PBL*

In this first phase of the study, students were introduced to the concept of PBL. This was accomplished by having them address a 'practice' PBL problem. This practice problem was intentionally constructed to promote student learning about PBL while simultaneously actively engaging them in the PBL process. Three main themes surfaced from this phase: Contrasting Perspectives, PBL as a Relevant Approach for Occupational Therapy Students, and Positive Attitude Towards Group Learning.

*Contrasting Perspectives.* Students' initial reactions to PBL were diverse and sharply contrasting. They ranged from ecstatic to indignant. There were also some students who avoided the extremes; offering instead a more tempered response to their first encounter with PBL. The students who wholeheartedly and unreservedly embraced PBL did so for varying reasons. Marcy clearly appreciated that in PBL, the locus of control shifts from the teacher to the student. In her reflection paper she states:

In a PBL environment you and your group are your own teachers. You have to decide what to do with your class time, when to do your work and assign homework to yourselves. When I initially learned this I thought wow that sounds great; you get to do what you want, when you want!

In sharp contrast to the sanguine feelings espoused above, some students had distinctively negative reactions to their PBL orientation. Lola was unhappy with PBL's requirement to explore and analyze information and to identify her own learning needs:

PBL is very different from the conventional methods of teaching that I am used to, so at first I found it to be very frustrating. I did not want to go and do research on my own outside of class to learn the material, I just wanted to be lectured to. I felt lost because I was not sure if what I was researching was the correct material to be studying. Also, I did not want to work in a group, I just wanted to work alone. I felt like working in groups was a slow and inefficient method, and it was frustrating because there were six different points of view that we had to work with.

As previously stated, several students avoided the emotional extremes discussed above. These student responses showed that, despite some hesitation and uncertainty with PBL, they were open to its possibilities and excited to begin the process. Their reactions could be described as cautiously optimistic.

*Relevance of a PBL Approach for Occupational Therapy Students.* While students' reactions to PBL varied, most students identified PBL as a relevant and effective learning approach because the process mirrored skills needed in the real world of practice. Rae observed that PBL emphasizes the 'construction of knowledge' over the transmission of knowledge' and also stresses the application of knowledge to resolve issues:

Although traditional methods of teaching may be less time consuming, PBL guides students in constructing their own knowledge through problem solving and experience. It is more appropriate for us as OT students to learn to apply the knowledge we obtain rather than being able to recite it.

*Positive Attitude Towards the Group Learning.* Group work is an integral part of the PBL process. However, for students accustomed to learning in a traditional lecture format, group work is atypical. At the end of the PBL orientation period, the vast majority of students voiced a positive attitude towards group learning. Various reasons for this attitude were cited by the students: it more accurately represented the clinical setting, it provided opportunities for hearing different perspectives and it offered a social dimension to the learning experience.

*Phase Two: Case Study Introduction*

Simulating the process used by occupational therapy practitioners, the Case Study Introduction phase involved the PBL student groups preparing for their client's initial evaluation. Three main themes surfaced from this phase of the study: Swimming Upstream but with the Shore in Sight, Emerging Interdependence with Group Learning, and Emerging Connections to Clinical Reasoning.

*Swimming Upstream but with the Shore in Sight.* Students are recognizing and respecting the complex thinking process required in a PBL environment, but quick to point out it isn't necessarily an easy or comfortable process. Their comments reflect an implicit understanding that the student-driven learning (so highly valued in PBL) goes against the current of the traditional teacher-centered learning (privileged in many educational settings). Students concede that going with the flow (traditional learning) is less frustrating, time consuming and less arduous than PBL which one student characterized as "swimming upstream." Nevertheless, they are voicing that the rigor involved with PBL is resulting in an infinitely more rewarding learning experience. Students see where they want to be, and even though they are caught up in the struggle of swimming upstream, they don't feel as if they are drowning. For example, Ann provides a salient example of this when she shares "It's a little frustrating researching topics and trying to find answers to questions I don't even know, yet when I feel like I'm on the right track I get so much more excited because I feel like I got to that point on my own."

*Emerging Interdependence within Learning Groups.* There is a growing sense of interdependence of learning within groups. Students are (with increased frequency) referring to

themselves as a team. This is seen in their excitement about their fellow group members and in the development of friendships, sharing different perspectives, having fun with each other and thinking of PBL as a game. For example, one group nicknamed themselves Team Casey (a fictitious name they gave to their [as yet] unknown client). Tiffany shares:

Hi girls! I just wanted to say great job today. I think we are really working well together and coming up with some very interesting ideas about 'Casey'. I am enjoying brainstorming with all of you. I think some of our ideas were a little out there, but overall we made good progress. We have already seen other trains of thoughts and our research helped us understand possible connections between the 3 diagnoses. Learning more about the lobes of the brain and hypertension will help us. Go Team Casey!

*Emerging Connections to Clinical Reasoning.* Students are beginning to think in ways that make for a more effective clinical practice. Some students explicitly stated how they used clinical reasoning to design and evaluate their initial assessments. Casey indicated that the evaluation experience will test their clinical reasoning. She wrote, "I think we will be ok if we are good at thinking on our feet."

#### *Phase Three: Meeting the Client*

Meeting the client phase required the PBL student groups to conduct an evaluation, design and implement meaningful treatment interventions, document services provided, and identify and evaluate outcomes. The findings related to this phase are thematically categorized as: Authentic Involvement in the OT Process, Practicing Technical Skills, and Engaging in Multiple Aspects of Clinical Reasoning.

*Authentic Involvement in the OT Process.* The authentic involvement in the OT process presented students with the uncertainty, ambiguity and conflicting perspectives that comprise client treatment. Student postings indicated the authentic involvement allowed them to make connections with prior learning, deepen their knowledge base, and provided a context for them to practice their skills. Shannon indicated that the real-life client experience brought the concept of clinical reasoning from "text to life." She writes. "Reading about clinical reasoning I learned how to define the types: basic memorization. It did not enlighten me as to how the types of reasoning are actually applied and come to life."

*Practicing Technical Skills.* Occupational Therapist must be able to think critically, analyze and synthesize information, and design creative and meaningful treatment activities for their client. However, it is also critical that they are technically competent when carrying out specific assessments and treatment interventions. Students indicated that this PBL assignment provided them with opportunities to address their interviewing skills, documentation skills, and their technology skills.

*Opportunity to Engage in Clinical Reasoning at Multiple Levels.* Students were engaged in the process of interpreting the data they had collected during their evaluation with their client and attempting to use it to make decisions about treatment; in effect they were clinically reasoning. It was evident from their postings and intervention papers that as they moved through the OT process, they employed various types of clinical reasoning including procedural, interactive, pragmatic, narrative, and ethical (Fleming, 1991, 1994b, Mattingly, 1994b, Rogers, 1983, Schell & Cervero, 1993). These various types of reasoning were identified under the following subcategories: Building on Formal Knowledge, Connecting to the Client through Interactive Reasoning, Constructing a Client Story through Narrative Reasoning, and Connecting Client to Context. The various aspects of clinical reasoning discussed in these subcategories rarely occur in a linear fashion. Rather, the students continuously interacted with and questioned



their evaluation and treatment data and that which they had accumulated from prior learning in their efforts to bring meaning to their client's situation.

#### *Phase Four: Final Reflections*

The three main themes that surfaced from this final phase of the study were: Growing Pains, Greater Self-Efficacy, and The Relationship of PBL to Clinical Reasoning. Additionally, the findings from the modified SACRR pre-post test are presented here.

*Growing Pains.* Growing Pains alludes to a natural and healthy process (albeit painful at times) wherein students were able to see that the stress, confusion, frustration, and increased responsibility associated with their PBL experience contributed positively to their maturing process. For example, Ann writes, "PBL forced us to raise our eyes above our limited horizon and stretch and grow by constructing new knowledge – it was both rigorous and rewarding."

*Greater Self-Efficacy.* Self-efficacy is an individual's level of confidence and self-judgment regarding ability to organize and implement actions needed to perform effectively (Kielhofner, 2005). Many of the students indicated their PBL experience contributed to an increased level of professional competence and identity. "PBL provided us with a real world problem that motivated us to use our hands, minds and emotions to learn. I now have a much stronger identity as an OT."

*The Relationship of PBL to Clinical Reasoning.* The overwhelming majority of students indicated they saw a relationship between PBL and clinical reasoning. For example, one student stated:

PBL gave me new insight in how to, in simple words, think... Since we did not have the answers given to us directly, it was vital to learn how to carry out our activity and the process following the intervention on our own.

Another student states the connection between PBL and clinical reasoning this way:

The self-directed learning in PBL brings you into contact with an enormous amount of information. You learn to filter information, separating the relevant from the irrelevant. Clinical reasoning requires the therapist to view the client holistically. In coming to understand our client, we gathered a lot of information. We then had to think about the information and decipher what was most relevant given her current situation.

*SACRR Results.* Data from The Self-Assessment of Clinical Reflection and Reasoning (SACRR) developed by Royeen et al (2001) were analyzed using an independent t-test. Of the 36 study participants, 33 (91.6%) responded to the pre-test, and 31 (88.5%) responded to the post-test. The results showed a statistically significant improvement at the  $p < .018$ . Cronbach's alpha was .762 for the pre-test and .846 for the post-test, which suggest that even with the slight modifications made to the instrument for this study; the SACRR has high internal consistency.

### **Discussion and Implications**

The findings of this study focused on the students experience with problem based learning and its relationship to clinical reasoning. Learning in a PBL environment was captured metaphorically by one student as "swimming upstream but with the shore in sight." As implied by this metaphor, students immediately recognized that learning in a PBL environment presented challenges they had not previously experienced in more traditional classroom settings. This necessitated that students re-conceptualize their approach to learning. Doing so required them to not only adjust their own learning style, but also to redefine their roles in the learning process. While students described the process of adjusting to PBL as challenging, students also voiced positive attitudes and feelings towards some characteristics of PBL; these characteristics reinforced the assumption

that PBL though challenging, *was* do-able! Relevant findings related to PBL included how students reacted to PBL, the importance of collaboration in PBL, how the facilitator reacted to the use of PBL within her classroom, and the significance of the relationship between the students and the facilitator.

Overwhelmingly, participants in this study indicated that they gained a deeper understanding of clinical reasoning and its application to the occupational therapy process. Relevant findings related to clinical reasoning emphasized that the students thinking processes exceeded what typically is called 'textbook' learning. Using the metaphor 'panning for gold', participants discussed how clinical reasoning was a process; it included trial and error, shifting though information and determining relevance and priority. Quantitative data from The Self-Assessment of Clinical Reflection and Reasoning Pre-and Post test (were analyzed using an independent t-test. Of the 36 study participants, 33 (91.6%) responded to the pretest, and 31 (88.5% ) responded to the posttest. The results showed a statistically significant improvement at the  $p < .018$ . Cronbach's alpha was .762 for the pretest and .846 for the posttest.

Findings relevant to the relationship between PBL and clinical reasoning showed that students found PBL to be an ideal setting to foster their clinical reasoning skills. Students in this study recognize that both PBL and clinical reasoning require them to use some of the same thinking processes. Additionally, students readily identified that both PBL and clinical reasoning are collaborative processes.

The findings of this study are quite significant, such that it demonstrates both a quantitative and qualitative link between PBL and clinical reasoning. Additionally, the use of PBL may, in fact be highly suited to the diverse needs of an adult population. While some adult students may still bring to the classroom their view of the teacher as the authority figure; it can be argued that most students will bring to bear their relevant experiences within a wide range of work environments. In workplaces today, employees at all levels are increasingly expected to be problem solvers (despite sometimes imperfect information). In short, their work experiences often embody PBL at all levels.

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